

20th. Alabama.—Mobile: light and heavy rain, accompanied by high wind, prevailed throughout the day; the water front in the city was flooded to a depth of three feet. **Florida.**—Pensacola: the wind blew a gale nearly all day; a maximum velocity of sixty miles per hour occurred at 4.20 p. m., causing considerable damage to property. **Michigan.**—Marquette: an unusually severe thunder-storm, accompanied by heavy rain, high wind, and large hail, passed over this city between 2.55 and 3.10 p. m.; the wind, which had a spiral motion, blew at the rate of forty-eight miles per hour, and caused much damage in this city; a large number of shade trees were either broken off or torn up by the roots, and numerous large buildings were unroofed or otherwise damaged; much injury was also done by the heavy rain, by flooding cellars, etc. **Mississippi.**—University: heavy rain and southeast wind prevailed during the entire day; the cotton and corn crops throughout the state were seriously damaged by the storm, and trains were delayed on account of washouts on the railroads. **Tennessee.**—Memphis: rain began at 8.57 a. m. and continued during the day, falling heavily throughout the afternoon, and ended at 11.55 p. m., with high wind from 4.30 to 11 p. m. The streets in some parts of the city were flooded, and Gayso Bayou rose eighteen feet, flooding cellars and houses along its banks and carrying away considerable fencing, etc.; the wells of the artesian water works were partially destroyed; crops, fruit and shade trees, and property in general sustained serious injury. The telephone connections were broken throughout the city and telegraph communication south of here was cut off. The rainfall accompanying this storm was the heaviest that has occurred here for many years. **Virginia.**—Norfolk: nearly 3.25 inches of rain fell during the day; the rainfall was especially heavy from 1.45 to 1.55 p. m., during which time 2.48 inches fell.

20th-21st. Tennessee.—Nashville: heavy rain, accompanied by high wind, began in the evening of the 20th and continued until early morning on the following day, maximum velocity of wind forty-nine miles per hour from the west at 8.55 a. m. The storm caused little damage in and around this city, but was particularly severe from thirteen to thirty miles west of here, where much corn was destroyed and many barns were blown down.

21st. Delaware.—Wilmington: about 6.20 p. m. a tornado caused great damage in this city and vicinity. The course of the storm was in a northeasterly direction, its path being about two hundred yards in width and about five miles in length. More than twenty persons were injured and one was killed. The damage caused by the tornado is variously estimated at from \$100,000 to \$200,000.

NOTE.—The Chief Signal Officer is indebted to Mr. J. Traverse Jones, of Wilmington, Del., for a series of photographs and sketches showing the debris of demolished buildings, prostrated trees, etc., in the path of the above mentioned tornado. The illustrations furnished by Mr. Jones show that this storm was of the most violent class of its character.

Odessa, New Castle Co.: the destructive storm of this date passed about three miles north of this place in a northeasterly direction.

Maryland.—The Signal Service observer at Baltimore reports the following:

The tornado which swept through Prince George's, Anne Arundel, Cecil, and Kent counties appears to have developed in southern Maryland. The first severe damage was done at Jacobsville, Anne Arundel Co., where, between

2.30 and 3 p. m., huge black clouds were observed in the southwest; the clouds moved toward the town and assumed the shape of a funnel and a roaring sound like that of a distant railroad train was heard. The lightning flashed, and a steam-like vapor was visible. The tornado passed through the village, after which it moved to the northeast; its progressive velocity was alternately swift and slow, and it travelled in a zig-zag course. The track varied from thirty feet to a quarter of a mile in width. It moved northeastward across Chesapeake Bay, where water-spouts were formed. About 3 p. m. it struck the village of Still Pond, in Kent county, destroying a cannery and killing eleven persons. About eighteen or twenty persons were injured at other points in the tornado's track. Great destruction was done; houses, fences, trees, and out-buildings were blown down, and crops badly damaged, entailing a loss of many thousands of dollars.

Bowie, Prince George's Co.: a violent local storm, of short duration, occurred here this date. Several buildings were moved from their foundations and whole orchards in the surrounding country were destroyed. The public school building at Bowie was moved fifteen feet. **Woodwardville, Anne Arundel Co.:** about 3.15 p. m. a tornado passed through this section, destroying buildings, etc. **Gambrill's, Anne Arundel Co.:** a severe storm, moving in a northeasterly direction, occurred between 2 and 3 p. m., causing some damage to orchards; it was of about ten minutes' duration. **Chester-town, Kent Co.:** a violent whirlwind passed through a section of this county in the afternoon. It appears to have been most severe in the vicinity of Still Pond, where several buildings were destroyed; among them a cannery, in which about forty persons were employed; of that number eleven were killed and several more or less seriously injured. **New Jersey.**—Salem, Salem Co.: during the afternoon the Salem Brick Works were nearly destroyed, and many other buildings were damaged. **North Carolina.**—Greensborough, Guilford Co.: an unusually violent storm prevailed nearly all day, causing great damage to orchards and crops. **Wilmington:** the high wind which prevailed from 2.03 until 9.28 p. m. caused considerable damage to crops and shade trees. **Pennsylvania.**—Philadelphia: light and heavy rain fell at intervals from 7.05 a. m. until midnight, during which time 2.00 inches of water fell; the rain caused considerable damage in various sections of the city.

27th. Massachusetts.—New Bedford, Bristol Co.: the hail-storm on the afternoon of this date was the severest that has occurred at New Bedford for a number of years. Much damage was done by lightning.

WATER-SPOUTS.

Key West, Fla.: Several large water-spouts were observed four or five miles from shore on the 19th.

The "Baltimore Sun" of the 22d says:

Four water-spouts burst over Chesapeake Bay yesterday. The remarkable meteorological phenomenon was accompanied by tall columns of black clouds moving in rapid rotation, the bay at their bases being violently agitated and heaped up with a leaping or boiling motion, and the water being apparently carried up in large quantities. The funnel-shaped clouds seemed to descend near the mouth of the Patapsco River and pass up the bay over Poole's Island and Whorton's Point, following Elk River over Chesapeake City, and thence into Delaware. Several small vessels were capsized. On shore the wind overturned buildings, levelled fences, and picked up horses and vehicles and carried them hundreds of yards. Damages are reported from different parts of the state. Baltimore City was visited by a rain storm, in which the wind reached the velocity of twenty-two miles an hour, but did no damage.

Mr J. M. Wheatley, postmaster, Edesville, Kent Co., Md., reports that during the severe storm on the afternoon of the 21st several farmers in that vicinity observed water-spouts over Chesapeake Bay.

INLAND NAVIGATION.

FLOODS.

Greensborough, Guilford Co., N. C.: the heavy rainfall during the night of the 9th and on the 10th caused streams in this vicinity to rise to heights greater than have been known for many years. Nearly all of the country bridges were washed away; railroads were badly washed, and dams gave way.

Mobile, Ala.: on the morning of the 20th the high water in

the river covered the wharves and adjacent portions of the city; many stores were flooded, and some wharves and bath-houses were washed away. This flood was due in part to a gale which drove back the water from the bay.

New Orleans, La.: the whole city was inundated on the 20th, nearly ten inches of rain having fallen on that date. About one hundred coal barges on the river were sunk, caus-

ing a loss of about \$250,000. The damage to sugar-cane, cotton, and rice was estimated at about 25 per cent. of the total crop in the southern and eastern portions of the state.

Altoona, Blair Co., Pa.: the heavy rains of the 20th and 21st caused unprecedented freshets in the streams in this vicinity; all country roads leading to this city and Hollidaysburg were rendered impassable.

Washington, Washington Co., Pa.: great damage was sustained by the railroads from the very heavy rainfalls of the 20th and 21st; many bridges, and in some places the road bed, were washed away.

Wheeling, West Va., 21st: a destructive freshet occurred here on this date, many bridges in the surrounding country were washed away. At 6 p. m. the large stone bridge over Wheeling Creek gave way. This bridge was constructed in 1842 and was considered one of the landmarks of the city. At Elm Grove, about five miles from Wheeling, nearly all the buildings were flooded, the damage being estimated at \$25,000.

Reading, Pa.: all streams in this (Berks) county were greatly swollen by the heavy rains of the 21st; the lowlands were inundated and several bridges were washed away.

Uniontown, Fayette Co., Pa.: the very heavy rains during the night of the 20th and 21st and following day flooded the lower portions of the town; south of this place farms were flooded, and bridges washed away.

Bellaire, Belmont Co., Ohio: crops on lands adjacent to streams were ruined by the freshet of the 21st, and much fencing was washed away; washouts occurred along all the railroads in this vicinity.

New Haven, Conn.: the heavy rainfall of the 21st flooded the streets and caused damage to goods stored in cellars, etc.

Pittsburg, Pa.: the heavy rains of the 21st submerged the lowlands in this vicinity; numerous bridges, and in some instances out-buildings, were washed away. The Ohio River rose very rapidly on the 22d, reaching the highest stage, twenty-six feet, that has occurred since February 6, 1884. The river rose about eighteen feet in twenty-four hours.

Hot Springs, Garland Co., Ark.: during the night of the 30th and 31st rain fell in torrents from 11 p. m. to 1 a. m.,

flooding the town. In several large hotels the water reached a depth of four feet; many buildings were totally wrecked.

HIGH TIDE.

Cedar Keys, Fla., 19th.

LOW TIDE.

Southport, N. C. 14th.

In the following table are shown the danger-points at the various stations, the highest and lowest depths for August, 1888, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, August, 1888 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, La.....	29.9	1	14.0	27	3.0	11.0
<i>Arkansas River:</i>						
Fort Smith, Ark....	22.0	31	11.7	15	1.2	10.5
Little Rock, Ark....	23.0	31	4.8	22	2.4	2.4
<i>Missouri River:</i>						
Omaha, Nebr.....	18.0	7, 8, 10	10.3	29, 30	8.2	2.1
Leavenworth, Kans.	20.0	12	12.4	20, 29	10.7	1.7
Kansas City, Mo.....		12	14.7	31	9.6	5.1
<i>Mississippi River:</i>						
Saint Paul, Minn....	14.5	5	5.7	31	3.0	2.7
La Crosse, Wis.....	24.0	14, 15, 16	7.6	31	4.8	2.8
Dubuque, Iowa.....	16.0	20, 21	7.7	31	5.3	2.4
Davenport, Iowa.....	15.0	22	5.7	7, 31	4.0	2.7
Keokuk, Iowa.....	14.0	19	6.4	8, 9	4.0	2.4
Saint Louis, Mo.....	32.0	15	19.4	6	12.9	6.5
Cairo, Ill.....	40.0	31	24.1	8	12.7	11.4
Memphis, Tenn.....	34.0	31	18.2	10, 11	10.6	7.6
Vicksburg, Miss.....	41.0	1	24.1	19	12.0	12.1
New Orleans, La.....	13.0	1	7.8	25, 26	4.0	3.8
<i>Ohio River:</i>						
Pittsburg, Pa.....	22.0	22	26.0	31	2.3	23.7
Cincinnati, Ohio....	50.0	26	32.0	7, 10	5.5	26.5
Louisville, Ky.....	25.0	28	12.3	10, 11, 12, 16, 17	3.9	8.4
<i>Cumberland River:</i>						
Nashville, Tenn.....	40.0	26	12.6	17	0.9	11.5
<i>Tennessee River:</i>						
Chattanooga, Tenn....	33.0	24	6.2	1, 19, 20	2.0	4.2
<i>Monongahela River:</i>						
Pittsburg, Penn.....	29.0	22	26.0	31	2.3	23.7
<i>Savannah River:</i>						
Augusta, Ga.....	32.0	23	13.1	19, 20	5.9	7.2
<i>Willamette River:</i>						
Portland, Oregon.....		1, 2	6.8	30, 31	4.0	2.8

*For fourteen days.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Only a few displays were noted during the month, the most noteworthy of which was that of the 3d, which was seen only in the Lake region and the Northwest. The following notes relate to the aurora above referred to:

Saint Paul, Minn., 3d: an auroral display was observed between 10.15 and 10.50 p. m.; it consisted of six brilliant streamers of yellowish light, which covered 25° of the horizon and rose to altitude 70°.

Marquette, Mich., 3d: a pale white auroral arch, with several bright streamers, covering about 65° of the northern horizon, was observed from 9.35 to 10.50 p. m.

Alpena, Mich., 3d: a few faint auroral streamers, having an apparent motion from west to east, were observed at 8.30 p. m.; the display was obscured by clouds at 10 p. m.

The observer at Saint Vincent, Minn., reports:

A diffuse auroral light, low in the horizon, was observed at 10.10 p. m., 15th; at 10.40 it had developed into an arch which covered 130° of the horizon and reached an altitude of 55°; at 11 p. m. the aurora waned, but revived again, and its maximum brilliancy occurred at midnight, at which time the display consisted of two bright arches and active "merry dancers," the upper arch having the same dimensions as the first one observed. The display ended during the night.

At Spokane Falls, Wash., a very brilliant and well-defined auroral arch of whitish color was first observed at 3 a. m., 16th; the arch covered 20° of the horizon and rose to altitude 35°; it began to fade at 6.30, and had disappeared at 8 a. m.

Auroras were observed during the month as follows: 2d, Bar Harbor and Orono, Me.; Embarras, Wis. 3d, Bismarck, Kimball, Medford, Pine River, and Webster, Dak.; Cresco and Maquoketa, Iowa; Alpena, Marquette, and Thornville, Mich.; Saint Paul, Minn.; Deuster, Wis. 5th, Dubuque, Iowa. 11th, Davenport and Webster, Dak.; Saint Vincent, Minn.; Fort Maginnis, Mont.; Deuster, Wis. 12th, Moorhead, Minn. 13th, Deuster, Wis. 14th, Eden Centre, N. Y. 15th, Saint Vincent, Minn. 16th, Webster, Dak.; Moorhead and Saint Vincent, Minn.; Fort Maginnis, Mont.; Spokaue Falls, Wash. 17th, Moorhead and Saint Vincent, Minn.; Green Bay, Wis. 18th, Benton Harbor, Mich. 26th, Embarras, Wis. 30th, Keokuk, Iowa. 31st, Grand Forks, Dak.; Pekin, Ill.

THUNDER-STORMS.

It will be seen from the accompanying table that thunderstorms were reported from the largest number (thirty-four) of states and territories on the 4th, and nearly as many (thirty) occurred on the 1st and 16th. They were least extensively reported on the 23d and 24th, on which dates they occurred on the former in nine and the latter date in seven states and territories. In Florida, Georgia, Illinois, Kansas, Louisiana, Michigan, Missouri, Tennessee, and Texas thunderstorms occurred on from twenty-two to twenty-eight days during the month; Illinois and Kansas reporting the maximum number of dates. They occurred on five days, or less, in California, Connecticut, the District of Columbia, Idaho, Maine, Nevada,